

**ADDENDUM No. 3 – Fort Sam Transportation Projects**

**CITY OF SAN ANTONIO**

**Capital Improvements Management Services Department**



**PROJECT NAME: Fort Sam Transportation Projects**

**DATE: August 18, 2011**

This addendum shall be included in and be considered part of the plans and specifications for the above named project. The contractor shall be required to sign an acknowledgement of the receipt of this addendum at the time he receives it and returns the original signed form with the bid package.

CIMS Project No. 40-00015

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**GENERAL:**

Pre Bid Meeting Minutes included below:

TO: Meeting Attendees  
FROM: David McBeth  
SUBJECT: Fort Sam Transportation Projects: Pre Bid Meeting  
MEETING DATE: August 16, 2011  
MEETING TIME: 9:00 a.m.  
VENUE: 9<sup>th</sup> Floor Conference Room at Municipal Plaza Bldg

**MEETING MINUTES**

- 1) Introductions
  - a) City Project Team – COSA CIMS
  - b) Design Team: Tetra Tech, Rolando Escamilla, P.E.
  - c) TXDOT
  - d) Contractors
- 2) Project Summary
  - a) Brief Project Description (Tetra Tech.)

- b) Funding –Special reporting requirements and deadlines
- c) Bid Opening scheduled for Tuesday, August 23, 2011, by 2 PM to City Clerk
- d) Duration: 182 Calendar Days
- e) Construction Estimate: \$6.1 Million Overall

3) Comments from Utilities

- a) CPS—Pending additional stacking from Winans to Rittiman
- b) CPS-gas—pending review from Ft. Sam legal department
- c) AT&T---Please ensure 1-week in schedule so they can concrete encase their line at the Rittiman intersection
- d) TWC--NONE
- e) SAWS—Water replacement lines of 12 and 6-in lines, small sewer joint replacement and recycle main adjustments
- f) COSA Utility Coordinator---NONE
- g) Others ---NONE

4) Comments from City Staff

Please get with CPS early to ensure proper electricity for field office.

- a) Contracts
  - i. Compliance—Bids due by 2 p.m.; 8/23/2011
  - ii. DBE—5% requirement, information due 7-10 days after contract awarded.
  - iii. Wage & Hour—State and Fed mandates
  - iv. General items
- b) Storm Water---NONE
- c) Traffic---NONE
- d) City Arborist---NONE, but tree preservation plan is in plans.
- e) Environmental (Waste Management Plan)—AOC at Rittiman and Harry Wurzbach intersection, will need 1-week notice before work begins in that area. An NOI is required. SAWS will do inspections on silt fences and so forth.
- f) Inspections--NONE
- g) Others---Addendum#1 will be issued to address some Spec Provision naming and drainage sheets.

COMMENTS AND QUESTIONS FROM CONTACTORS:

- 1. On pg. 11 will Ty B be used instead of lime? Will item be added to pay app?
- 2. Can you provide GeoPak files?
- 3. Will there be any delays to the NTP?
- 4. What are DBE requirements?

5. Do plans call for TY A embankment? What spec is related?
6. Is there a geotech report provided with plans?
7. Will contractor have to provide air monitoring, health and safety plan at their expense?
8. Spoils that have to be disposed of, is there a pay item for this removal?
9. What are work hours?
10. Does DBE requirements have to be met by local contractors/subs
11. Can we have a cost estimate for bracing CPS-poles and contact information?
12. Any issues with cemetery possibly shutting down job due to noise?

RESPONSES FROM CONSULTANT:

1. The additional quantity of TY B mix at the intersection has been included in the quantity of the mix.
2. Consultant will not be providing GeoPak Files.
3. There will be no delays with the NTP at this time
4. The DBE requirement is 5%. Consultant is including the revised COSA DBE Percentage Goal Form.
5. Yes, the plans call for TY A embankment.
6. There are no geotech reports included in the plans,, Consultant has included a pdf of the geotech report.
7. Yes, Contractor will have to provide air monitoring, health and safety plan at their expense.
8. Spoils that have to be disposed are subsidiary to bid item 110 EXCAVATION.
9. The work hours are daylight hours and 48-hour notice for weekend work.
10. Local contractors/subs DBE's are preferred but not mandatory as long as they are certified through SCTRCA (South Central Texas Regional Certification Agency).
11. CPS estimated a cost of \$2100 for bracing CPS-poles. Please contact Christopher Lansford with CPS at 353-2812 for a more accurate cost.
12. The project will not be shut down due to noise to the cemetery but please be mindful of funeral processions. City will coordinate with Ft. Sam of any scheduled services during construction. TCP addresses possible concerns with cemetery issues.

ATTACHMENTS:

1. CITY OF SAN ANTONIO DISADVANTAGED BUSINESS PERCENTAGE GOAL FORM
2. PDF of Geotech Report.

END OF ADDENDUM No. 3

**ADDENDUM REVIEWED & APPROVED BY:**

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CIMS Project Manager

Date

**NOTICE TO PLANHOLDERS:**

Please insert this Addendum into your copy of the Project Construction Documents.

**CITY OF SAN ANTONIO  
DEPARTMENT OF CAPITAL IMPROVEMENTS MANAGEMENT SERVICES  
CONTRACT SERVICES DIVISION**

RECEIPT OF ADDENDUM NUMBER(S) 3 IS HEREBY ACKNOWLEDGED FOR PLANS  
AND SPECIFICATIONS FOR CONSTRUCTION OF: **Fort Sam Transportation Projects**  
**40-00015**

FOR WHICH BIDS WILL BE OPENED ON **Tuesday, August 30, 2011**

THIS ACKNOWLEDGEMENT MUST BE SIGNED AND RETURNED WITH  
THE BID PACKAGE.

Company Name: \_\_\_\_\_

Address: \_\_\_\_\_

City/State/Zip Code: \_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name/Title



# CITY OF SAN ANTONIO

PROJECT NUMBER: CSJ:0915-12-470,ETC  
COSA NUMBER: 40-00015

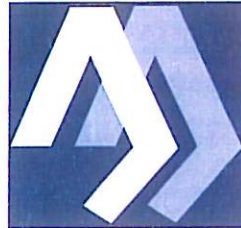
## **DISADVANTAGED BUSINESS ENTERPRISE PERCENTAGE GOAL**

The goal for Disadvantaged Business Enterprise (DBE) participation in the work to be performed under this construction contract is 5% of the contract amount.

Addendum No. 3 - adds 5%  
as a DBE Goal.

**Geotechnical Engineering Study  
Proposed CIMS-Fort Sam Houston  
Transportation Projects  
Pavement Reconstruction, Intersections  
on Harry Wurzbach Highway  
City of San Antonio 2007-2012 Bond Program  
San Antonio, Texas**

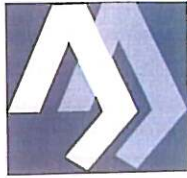
**Arias Job No. 2009-461**



**ARIAS & ASSOCIATES**  
Geotechnical • Environmental • Testing

**Prepared For  
Mr. Rolando Escamilla, P.E.**

**Tetra Tech, Inc.  
August 6, 2009**



# ARIAS & ASSOCIATES

Geotechnical • Environmental • Testing

August 6, 2009  
Arias Job No. 2009-461

Mr. Rolando Escamilla, P.E.  
Tetra Tech, Inc.  
Riverwalk Place  
700 North St. Mary's Street  
San Antonio, Texas 78205

**RE: Proposed CIMS-Fort Sam Houston Transportation Projects  
Pavement Reconstruction, Intersections at Harry Wurzbach Highway  
City of San Antonio 2007-2012 Bond Program  
San Antonio, Texas**

Dear Mr. Escamilla:

The results of our Geotechnical Engineering Study for the subject project are presented in this report. Our findings and recommendations should be incorporated into the design and construction documents for the proposed project. Please consult with us as needed during any part of the design or construction process.

We recommend that the site work and construction be tested and observed by one of our representatives in accordance with the report recommendations. We can contribute to the success of the project by performing the construction observation and materials testing services during construction.

Thank you for the opportunity to be of service to you.

Sincerely,  
Arias & Associates, Inc.

  
Ricardo Cruz, E.I.T.  
Geotechnical Project Manager

cc: 3 Above



  
Mark J. O'Connor, P.E.  
VP - San Antonio Operations

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### *Enclosures:*

- Vicinity Map
- Representative Photographs of Project Site
- Boring Location Plan
- Boring Logs B-1 through 6
- Classification & Symbol Explanation Sheet
- Paveprep SA Schematic Plan
- Appendix

## **INTRODUCTION**

The results of a geotechnical study for the proposed CIMS-Fort Sam Houston Transportation Projects in San Antonio, Texas is presented in this report. This project was authorized by Mr. Marc Long, P.E., and Vice President of Tetra Tech, Inc. by means of Tetra Tech Agreement with Arias, the Sub consultant, and Arias proposal number 2009-461 dated April 28, 2009. The contract was executed by Mr. Marc Long on June 4, 2009.

## **SCOPE OF SERVICES**

The purpose of this engineering study was to conduct a subsurface exploration and perform laboratory testing to establish engineering properties of the subsurface soil and groundwater conditions present on the site. This information was used to develop geotechnical engineering criteria for use by design engineers in preparing the pavement design(s) for widening and reconstructing the existing pavement. Environmental and foundation engineering studies of any kind were not a part of our scope of work or services.

## **PROJECT AND SITE DESCRIPTION**

It is our understanding that the proposed project will consist of pavement reconstruction and widening along three intersections of Harry Wurzbach Highway near Fort Sam Houston army base. The intersections included in this project are: Rittiman Road, Winans Road and Burr Road. Currently all roadway intersections include daily traffic flow. The scope of our services includes providing pavement reconstruction recommendations based on the City of San Antonio, CMIS Design Guidance Manual, Appendix 10-A "City of San Antonio Pavement Design Standards".

We are providing flexible asphaltic concrete pavement recommendations for an Arterial Street classification. If different street classifications are to be utilized, then we should be contacted to provide additional recommendations.

At the time of our study, the 3 intersections on Harry Wurzbach consist of 4-lane asphalt-paved roadways. Rittiman Road consists of a 6-lane asphalt-paved roadway with concrete curbs. There are several commercial developments along the Rittiman and Harry Wurzbach intersection. At the intersection of Winans Road a 2-lane asphalt-paved roadway is present. The intersection at Winans Road is used to enter the Fort Sam Houston army base. A residential community is located on the other side of Winans Road. At the intersection of Burr Road and Harry Wurzbach, Burr Road has 2-lanes of asphalt-paved roadway with concrete curbs. Onsite utilities are also present at all intersection. The project site is located near Fort Sam Houston army base in San Antonio, Texas. A Vicinity Map is included in the enclosures.

## **SOIL BORINGS AND LABORATORY TESTS**

Six (6) test borings were drilled at the approximate locations shown on the attached Boring Location Plans. The test borings were drilled to depths of approximately 6 feet below the existing ground surface. All drilling was conducted in general accordance with ASTM D1586 and ASTM D1587 procedures for Split Spoon and Shelby Tube sampling techniques as described in the Appendix. A truck mounted drill rig using continuous flight augers techniques together with the sampling tool noted were used to secure the subsurface soil samples at the boring locations.

Soil classifications and logging were conducted during the exploration by one of our field logging technician who is under the supervision of our Geotechnical Geologist. Final soil classifications, as seen on the attached logs, were determined in the laboratory based on laboratory and field test results and applicable ASTM procedures.

Pocket Penetrometer tests on clays in tons per square foot and standard penetration test (N-values) in blows per foot are noted on the boring logs. These values provide an indication of the consistency and strength of the subsurface materials.

As a supplement to the field drilling and sampling, laboratory testing to determine water content, expansion characteristics and percent passing the #200 sieve was conducted. The laboratory results are reported in the attached boring logs. Samples were examined, classified and tested both in the field during the sampling operation and after being received into the laboratory in accordance with the procedures stated in the Appendix of this report.

**Sample Disposal** *Remaining soil samples recovered from this exploration will be routinely discarded following submittal of this report.*

### **Sulfate Testing Results**

Laboratory testing was conducted on four (6) bulk samples of the soils at the site to determine the sulfate content. Testing was performed in accordance with TxDOT test method Tex-145-E "Determining Sulfate Content in Soils." The results indicate that the sulfate contents of the six (6) samples retrieved within approximately 2 to 6 feet of the existing ground surface range from approximately 100 parts per million (ppm) to 380 ppm. This is indicative of a *low sulfate content soil*, therefore, lime treatment of the soil is acceptable.

## **SUBSURFACE CONDITIONS**

### **Geology**

The earth materials underlying the project site have been regionally mapped as an older marine deposit of the Fluvatile terrace deposits Formation (Qt). Locally, the materials encountered in the test borings consist primarily of fill material comprised of brown to dark gray brown man-made fill soils and natural topsoils. The underlying formational materials are comprised of tan formational clays. The formational material was found to be very weathered and in a very stiff to hard condition

No faults of the Balcones Fault System have been mapped to cross through the project area. The Balcones Fault System has not had any known surface activity following the end of the Miocene epoch, approximately 5 million years before present, and from a geologic point of view the fault system is considered to be inactive and should pose minimal seismic risk to the proposed development.

### **Existing Pavement Structure**

Existing asphalt and flexible base material was observed at the boring locations which were performed within the existing roadway. The table below indicates the approximate asphalt and flexible base thickness encountered at each of the boring locations.

**Existing Pavement Structure**

<b>Boring No.</b>	<b>Approximate Boring Locations</b>	<b>Approximate Asphalt Thickness</b>	<b>Approximate Concrete Thickness</b>	<b>Approximate Flexible Base Thickness</b>
B-1	20' S. of Rittiman Road on Harry Wurzbach Highway	5"	--	12"
B-2	25' E. of Harry Wurzbach Highway on Rittiman Road	3"	--	10"
B-3	20' S. of Winans Road on Harry Wurzbach Highway	4"	5"	4"
B-4	5' W. of Winans Road on Harry Wurzbach Highway	3"	6"	7"
B-5	20' N. of Burr Road on Harry Wurzbach Highway	3"	6"	8"
B-6	10' S. of Burr Road on	5"	5"	6"

As indicated above, the asphalt generally ranges in thickness from approximately 3 to 5 inches with an average thickness of approximately **3.8 inches**. The concrete thickness generally ranges in thickness from 5 to 6 inches with an average thickness of approximately **5.5 inches**. The flexible base material generally ranges in thickness from approximately 4 to 12 inches with an average thickness of approximately **8 inches**. It should be noted that at the location of boring B-1 and boring B-2, a concrete material was not encountered. At the location of boring B-6, a core sample was performed on the existing asphalt and concrete materials. The core sample provided a more accurate thickness of asphalt and concrete thicknesses. The core showed a 5 inch asphalt thickness and a 6 inch concrete thickness.

## Site Stratigraphy and Engineering Properties

Generalized stratigraphy conditions are summarized in the following table.

### Generalized Soil Conditions – Rittiman Road Intersection

*Based on Boring Log B-1 and B-2*

Stratum	Depth (ft)	Material Type	PI range	No. 200 range	PP range	N range
			PI average	No. 200 average	PP average	N average
--	0 to (13' - 17")	Asphalt and Base Material	--	--	--	--
			--	--	--	--
I	(13"-17") to (6+)	Fill: Clay (CH-CL) and Clayey Gravel (GC), dark gray brown to dark brown and brown to tan, stiff to hard	23 - 53	60	3.25 - 5.5	19 - 47
			40	--	4.4	29

### Generalized Soil Conditions – Winans Road Intersection

*Based on Boring Log B-3 and B-4*

Stratum	Depth (ft)	Material Type	PI range	No. 200 range	PP range	N range
			PI average	No. 200 average	PP average	N average
--	0 to (13" - 16")	Asphalt, Concrete and Base Material	--	--	--	--
			--	--	--	--
I	(13"-16") to (2-4)	Fill: Clay (CH-CL), brown to tan and brown, stiff	44	--	5	16
			--	--	--	--
II	(2-4) to 6+	Clay (CL), tan and gray, very stiff	18-29	94	6.25-13	16
			24	--	8.5	--

## Generalized Soil Conditions – Burr Road Intersection

*Based on Boring Log B-5 and B-6*

Stratum	Depth (ft)	Material Type	PI range	No. 200 range	PP range	N range
			PI average	No. 200 average	PP average	N average
--	0 to (16" - 17")	Asphalt, Concrete and Base Material	--	--	--	--
			--	--	--	--
I	(16" - 17") to (4.5 - 6+)	Clay (CH), dark gray brown, stiff to very stiff	34 - 60	--	1.75 -2.5	9 - 15
			47	--	2.2	12
II	4.5 to 6+	Clay (CH), tan, stiff	--	99	2.5	--
			--	--	--	--

Where:

Depth	- Depth from existing ground surface at the time of geotechnical study, feet
PI	- Plasticity Index, %
No. 200	- Percent passing #200 sieve, %
PP	- Pocket Penetrometer value, tons per square foot
N	- Standard Penetration Test (SPT) value, blows per foot

### Groundwater

A dry sampling method was used to obtain the samples at the project site. Groundwater was not observed within the test borings during or after completion of the sampling activities which were performed on June 29, 2009. It should be noted that water levels may require several hours to several days to stabilize depending on the permeability of the soils. Provisions to intercept and divert the "perched" water off-site should be made if this condition is encountered during construction. Upon completion of the sampling activities, the soil borings were backfilled and the site cleaned as required.

Clay soils are generally not conducive to the presence of groundwater; however, pockets or seams of gravels, sands, silts or open fractures and joints can store and transmit "perched" groundwater flow or seepage. Groundwater levels at this site may be subject to seasonal conditions, recent rainfall, drought or temperature affects. Thus, seasonal weather conditions or other factors may dictate actual shallow groundwater conditions at the time of construction.

### Variations

Conditions may vary between the sample borings locations. Contacts, noted on the boring logs to separate material types, are approximate. Actual contacts may be gradual and vary at different locations. If conditions encountered during construction indicate more variation than established as a result of this study, we should be contacted to evaluate the significance of the changed conditions relative to our recommendations.

### PAVEMENT INTERSECTIONS PHOTOGRAPHS

The existing roadway at Harry Wurzbach Highway and the Rittiman Road Intersection is a 4 lane road. The north and southbound roads near the intersections are divided by a 20 foot grass median. The road along Rittiman Road near the intersection is made up of 6 lanes. The following photos are representative of the intersection at Harry Wurzbach and Rittiman Road.



The existing roadway at Harry Wurzbach Highway and the Winans Road intersection is a 4 lane road. The roadway along Winans Road is a 2 lane road which travels only in an eastward direction. The intersection of Winans Road and Harry Wurzbach Highway is used to enter the Fort Sam Houston army base entrance. The following photos are representative of the intersection at Harry Wurzbach and Winans Road.



The existing roadway at Harry Wurzbach Highway and the Burr Road intersection is also a 4 lane road. The roadway along Burr Road is a 2 lane road which travels only in a westward direction. At the intersection of Burr Road and Harry Wurzbach Highway existing commercial development is present on the southwest corner of the intersection. The following photos are representative of the intersection at Harry Wurzbach and Burr Road.



### **FLEXIBLE PAVEMENT RECOMMENDATIONS**

The pavement recommendations provided herein correspond to pavement widening of the existing pavement and overlaying a new surface course thickness over the existing roadways at the intersection of Rittiman, Winans and Burr Road.

#### **Pavement Widening and Overlay Recommendations**

It is understood that the new asphalt pavement recommendations will be used for the widening pavement areas. We understand that a section of the existing pavements outer perimeter will be removed. The removal will include taking out the existing asphalt, concrete and base material. We recommend that the existing pavements outer perimeter be removed down to the required subgrade elevation. As shown in the "Paveprep Schematic Plan" that is attached, the cut areas into the existing pavement sections should be stair stepped. The pavement section shown in the paveprep schematic plan is recommended to be used in all areas. In our field study, we encountered concrete material at the intersections of Winans Road and Burr Road. Although we did not encounter concrete at the intersection of Rittiman Road, concrete may still be present. Furthermore, it is our understanding that the top 2 inches of existing roadway is planned to be milled and a new surface course will be overlaid over the entire road area.

Paveprep SA is manufactured by Pavetech International and is distributed locally by Lone Star Products. The Paveprep SA fabric will help reduce the expected crack at the old pavement/new pavement joint.

At the location of the existing pavement section and the new widened lanes, a stair step cut is recommended as per the schematic. At the location of the existing pavement section, we recommend that a 1 foot horizontal step be cut above the existing concrete section along with a 1 foot cut above the existing flexible base section. The stair step cut will help to provide a link between the existing pavement section and the new pavement section. The stair step cut along with the Paveprep SA product can help reduce differential movement along the existing and new pavement sections. It should be noted that differential movement along the new pavement section and the existing pavement section can still occur.

Accumulation of water beneath the asphaltic surface course or concrete can cause progressive and rapid deterioration of the pavement section. Similarly, pavement surfaces should be well drained to eliminate ponding with a two-percent minimum slope, as possible.

### **PAVEMENT RECOMMENDATIONS**

Based on the results of our fieldwork and laboratory testing and once all of the existing asphalt and base are removed, it appears likely that the roadway subgrade will consist of high plasticity clay subgrade. In areas where the subgrade consists of high plasticity clay, we recommend that a subgrade CBR value of 2 be utilized and the subgrade be lime stabilized as outlined below.

It should be noted that the conditions and recommendations contained herein are based on the materials encountered at the time of field exploration. These conditions may differ once the road grading (cut/fill) operations are performed. At the time of this report, we have not received plan and profile sheets for this project. We recommend that a representative of Arias & Associates be retained to observe that our recommendations are followed and to assist in determining the actual subgrade material classification at a particular location.

Recommendations in this section were prepared in accordance with the 1993 AASHTO Guide for Design of Pavement Structure and the City of San Antonio CIMS Design Guidance Manual, Appendix 10-A "City of San Antonio Pavement Design Standards". The following design parameters were utilized:

**Material Coefficients**

Material	Structural Coefficient
Hot Mix Asphaltic Concrete – Type "D" Surface Course	0.44
Hot Mix Asphaltic Concrete – Type "B" Base Course	0.38
Flexible Base Course – TxDOT Item 247, Type A, Grades 1 or 2	0.14
6-inch Lime Stabilized Subgrade	0.48

### ESAL Calculation

Street Classification	Arterial Street
	Flexible Pavement
Average Daily Traffic, ADT (Provided by Tetra Tech, Inc.)	20,000
Analysis Period	20 years
Growth Rate	5%
18-kip Equivalent Axle Loads (ESALs)	3,800,000

### Pavement Design Parameters

Street Classification	Arterial Street
Reliability Factor	95%
Overall Standard Deviation	0.45
Initial Serviceability Index	4.2
Terminal Serviceability Index	2.5
18-kip Equivalent Axle Loads (ESALs)	3,800,000

### Arterial Streets

Based on the above parameters, a subgrade CBR=2 and the City of San Antonio UDC, a structural number, SN of 5.9 was attained (**Arterial Street**). This number is greater than the City of San Antonio maximum of 5.76. Therefore, the use of a structural number, **SN of 5.76** is recommended in the high plasticity clay subgrade areas.

The following pavement thickness options may be considered in order to meet the design requirements. Many other choices or alternatives are possible.

### Arterial Street– High Plasticity CLAY Subgrade: CBR=2 *Lime Stabilize Subgrade*

Option	Lime Stabilize Subgrade	Crushed Limestone Flexible Base	Type "B" HMAC Base Course	Type "D" HMAC Surface Course	Calculated Structural Number (SN)
1	6"	--	12"	2"	5.92
2	6"	--	11"	2.5"	5.76
3	6"	10"	8"	2"	5.80
4	6"	12"	6"	3"	5.76

## **PAVEMENT CONSTRUCTION CRITERIA**

### **Site Preparation**

Topsoil stripping should be performed as needed to remove existing asphalt, concrete, base, organic materials, loose soils, vegetation, roots, and stumps. A minimum depth of 3 to 4 inches should be planned. Additional excavation may be required due to encountering deleterious materials such as concrete, organics, debris, soft materials, etc. In addition, "nesting" of cobbles/boulders should be avoided.

### **Lime Stabilized Subgrade**

The high plasticity clay subgrade may be stabilized the specified thickness with lime by dry weight in accordance with City of San Antonio Standard Specifications for Construction, Item 108, "Lime Treated Subgrade". The quantity of lime required should be determined after the site is stripped of the loose soil and the subgrade soils are exposed. **We anticipate that approximately 6 to 10 percent lime will be required depending upon the material encountered. However, the quantity of lime should be sufficient to: (1) result in a pH of at least 12.4 when tested in accordance with ASTM C977, Appendix XI; and (2) reduce the PI of the clay subgrade to less than 20.** The target lime content and optimum moisture content should be determined in accordance with TxDOT test procedure TEX-120-E.

For the purposes of lime stabilization, the dry weight of the high plasticity clay soils may be taken as 105 pounds per cubic foot (pcf). The amount of lime required may vary over the site. The limed soil should be compacted to at least 95 percent of the standard Proctor maximum dry density as evaluated by TEX-114-E at moisture contents ranging from optimum to plus four (+4) percentage points of optimum moisture content. Compaction tests should be performed as outlined in the Quality Control section below.

### **Fill Requirements**

The general fill used to increase sections of the roadway grade should consist of onsite materials meeting or exceeding the existing subgrade CBR at each particular location. The general fill should be placed in accordance with City of San Antonio Standard Specifications for Construction, Item 108, "Embankment". The compaction should be performed in accordance with the "Density Control" method. Onsite material may be used provided it is placed in maximum 8" loose lifts and compacted to at least 95 percent of the standard Proctor maximum dry density as evaluated by TEX-114-E to within optimum to plus 3 percent of optimum moisture (PI>35). This fill should not have any organics or deleterious materials. When fill material includes rock, the maximum rock size acceptable shall be 6-inches. No large rocks (>6 inches) shall be allowed to nest and all voids must be carefully filled with small stones or earth and properly compacted.

The CBR of all fill materials used should be equal to or exceed the existing subgrade CBR at each particular location. The suitability of all fill materials should be approved by the Geotechnical Engineer. Conformance testing during construction to assure quality will be necessary for this process. If fill is required to raise paving grades, the above compaction criteria should be utilized with the fill placed in maximum 8" thick loose lifts. It should be noted that if fill materials with lower CBR values are placed, then a higher Structural Number and a thicker pavement section would be necessary.

#### **Flexible Base Course**

The base material should comply with City of San Antonio Standard Specifications for Construction, Item 200, "Flexible Base", Type A or B Grade 1 or 2. The compaction should be performed in accordance with the "Density Control" method. The flexible base should be compacted in maximum 8-inch loose lifts to at least 95 percent of the maximum dry density as evaluated by TEX-113-E within plus or minus 3 percent of optimum moisture content. Compaction tests should be performed as outlined in the Quality Control section below.

#### **Asphaltic Base Course**

The asphalt should comply with City of San Antonio Standard Specifications for Construction, Item 205, "Hot Mix Asphaltic Concrete Pavement", Type B, Base Course. Compaction tests should be performed as outlined in the Quality Control section below.

#### **Asphaltic Concrete Surface Course**

The asphalt should comply with City of San Antonio Standard Specifications for Construction, Item 205, "Hot Mix Asphaltic Concrete Pavement", Type D, Surface Course. Compaction tests should be performed as outlined in the Quality Control section below.

### **CONSTRUCTION CRITERIA**

#### **Site Preparation**

Topsoil stripping should be performed as needed to remove asphalt, concrete, organic materials, loose soils, vegetation, roots, and stumps. Exposed subgrade from excavations or grading operations should be prepared as outlined above in the "Pavement Construction" section and compacted to a density of at least 95 percent of the standard Proctor maximum dry density as evaluated by TEX-114-E. A loaded dump truck should be utilized to proofroll over the given Subgrade area and a representative of the Geotechnical Engineer should witness the operation. Areas of deflection should be removed and replaced as per the representative of the Geotechnical Engineer.

We recommend that one of our representatives be scheduled to observe that the site preparation operations are performed in accordance with our recommendations.

If existing structures or deleterious materials are discovered during excavation, we should be informed immediately to determine the impact of those structures on our recommendations.

### **Earthwork**

Exposure to the environment may weaken the soils at the bearing level if the excavation remains open for long periods of time. Therefore, it is recommended that all excavations be extended to final grade and constructed as soon as possible in order to minimize potential damage to bearing materials. If bearing materials are exposed to severe drying or wetting, the unsuitable material must be re-conditioned or removed as appropriate. The bearing level should be free of loose soil, ponded water or debris and should be observed by the geotechnical engineer or his representative.

Subgrade preparation and fill placement operations should be monitored by the soil engineer or his representative. As a guideline, at least one in-place density test should be performed for each 5,000 sq. ft. of compacted surface per lift or a minimum of three tests per lift. Any areas not meeting the required compaction should be recompacted and retested until compliance is met.

### **Excavations**

Excavations should comply with OSHA Standard 29CFR, Part 1926, Subpart P and all State of Texas and local requirements. Trenches 20 feet deep or greater require that the protective system be designed by a registered professional engineer. A trench is defined as a narrow excavation in relation to its depth. In general, the depth is greater than the width, but the bottom width of the trench is not greater than 15 feet. Trenches greater than 5 feet in depth require a protective system such as trench shields, trench shoring, or sloping back of the excavation side slopes.

The Contractor's "Competent Person" should perform daily inspections of the trench to verify that: (1) the trench is properly constructed; (2) surcharge and vibratory loads are not excessive; (3) excavation spoils are sufficiently away from the edge of the trench; (4) proper ingress and egress into the trench is provided; and (5) all other items are performed as outlined in these OSHA regulations. It is especially important for the inspector to observe the effects of changed weather conditions, surcharge loadings, and cuts into adjacent backfills of existing utilities. The flow of water into the base and sides of the excavation, and the presence of any surface slope cracks, should also be carefully monitored.

Although the geotechnical report provides an indication of material types to be anticipated, actual material and groundwater conditions could vary along the excavation. The "Competent Person" must evaluate the materials and groundwater in the excavation at the time of construction to verify that proper sloping or shoring measures are performed.

Appendix B to the regulations has sloping and benching requirements for short-term trench exposure for various soil types up to the maximum allowable 20-foot depth requirement.

### **Quality Control**

As Geotechnical Engineer of record, we should be engaged to: (1) observe and evaluate earthwork for site subgrade improvement activities to determine that the actual bearing materials are consistent with those encountered during the field exploration; (2) monitor and test the fill placement and subgrade preparation; and (3) monitor and test the base material and asphalt placement and compaction. It is also important that we be given the opportunity to review the design and construction documents. The purpose of this review is to check to see if our recommendations are properly interpreted into the project plans and specifications.

Subgrade preparation and fill placement operations should be monitored by the Geotechnical Engineer or his representative. As a guideline, at least one in-place density test should be performed according to the table below, with a minimum of 3 tests per lift. Any areas not meeting the required compaction should be recompact and retested until compliance is met.

**Table 13: Density Test Requirements for Roadway Elements**

Element	Street Classification	Pavement Width	Frequency of Density Tests
Subgrade, Flexible Base, Asphaltic Base, Asphalt Course(s)	Primary or Secondary Arterial	60' or more	Every 100 Linear Feet for each Lift

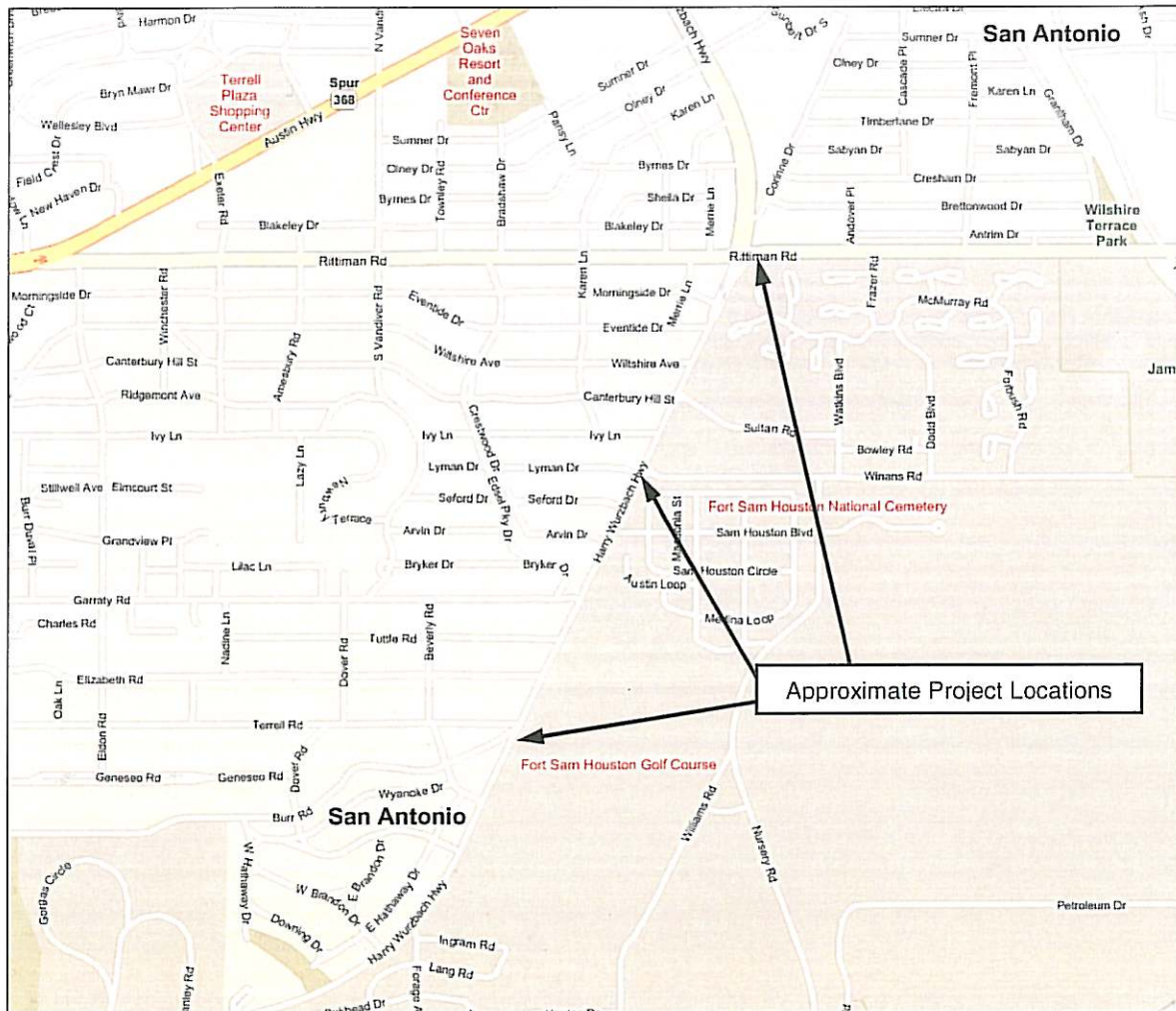
*The table above is based on the City of San Antonio requirements.*

### **GENERAL COMMENTS**

This report was prepared for this project exclusively for the use of Tetra Tech, Inc. and their design team. If the development plans change relative to roadway layout, size or street classifications, or if different subsurface conditions are encountered, we should be informed and retained to ascertain the impact of these changes on our recommendations. We cannot be responsible for the potential impact of these changes if we are not informed.

This report has been prepared in accordance with generally accepted geotechnical engineering practice with a degree of care and skill ordinarily exercised by reputable geotechnical engineers practicing in this area.

# VICINITY MAP



## Proposed CIMS-Fort Sam Houston Transportation Rittiman Road, Winans Road and Burr Road Intersections Pavement Reconstruction San Antonio, Texas

# BORING LOCATION PLAN



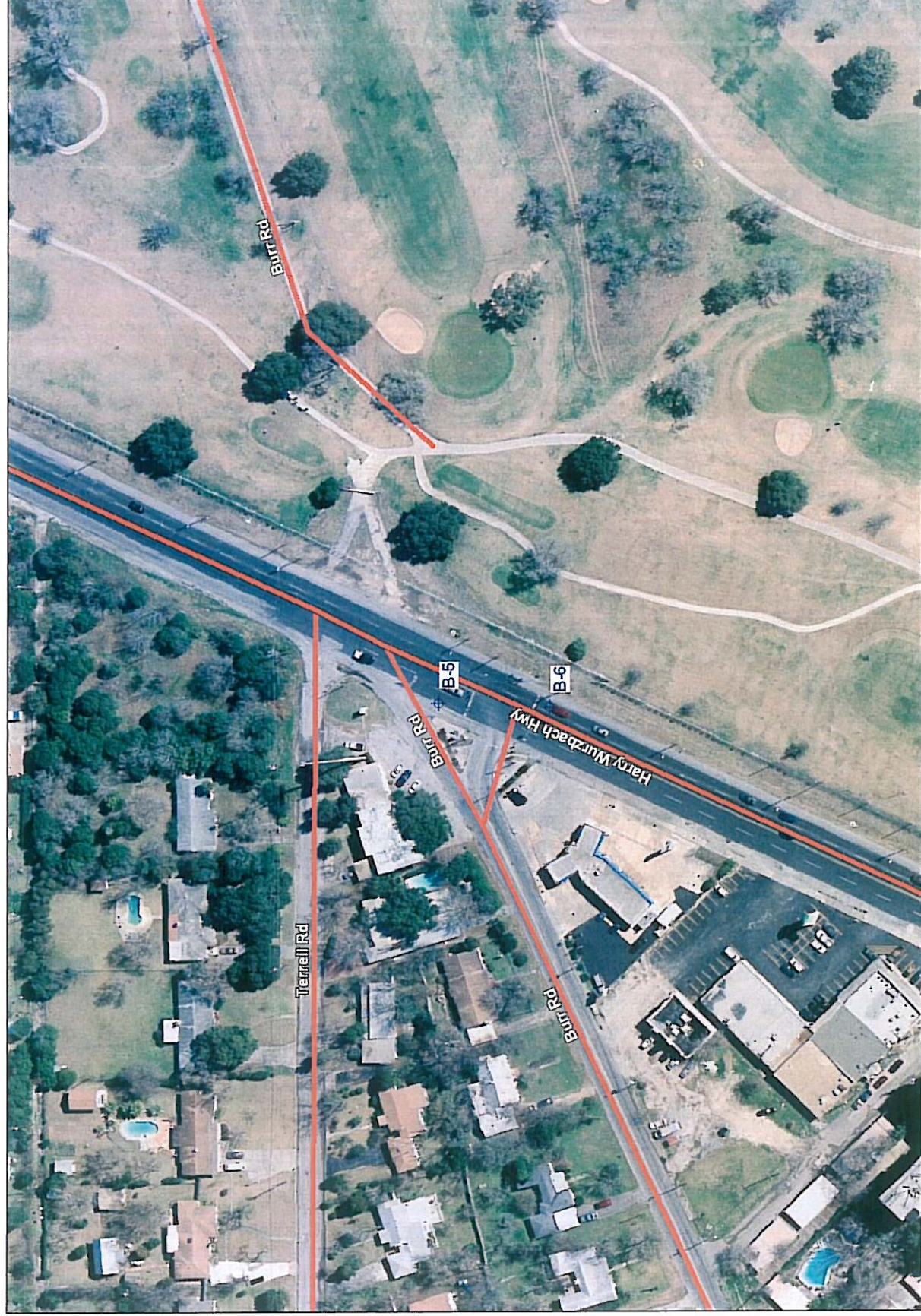
NOTE: Locations are approximate. Drawing is not to scale.

# BORING LOCATION PLAN



NOTE: Locations are approximate. Drawing is not to scale.

# BORING LOCATION PLAN



NOTE: Locations are approximate. Drawing is not to scale.

# Boring Log No. B-1



Address: Intersections of Harry Wurzbach Highway  
San Antonio, Texas  
Location:

Project: CIMS-Fort Sam Houston Transportation  
Logged By: ME Elev.:  
Sampling Date: 6/29/09

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N	-200
5" ASPHALT									
12" BASE, tan	1	1: GB	6						
FILL: CLAY (CH), dark brown, very stiff	2	2: SS	26	22	61	39		23	
-with Gravel, some Sand	3								
	4	3: SS	19					19	60
	5	4: ST	21	23	66	43	3.25		
Completion Depth: 6.0 ft.	6								
	7								
	8								

Groundwater During Drilling: None Observed

- Grab Bag Sample (GB)
- Shelby Tube Sample (ST)
- Split Spoon Sample (SS)
- Water encountered during drilling
- Delayed water reading

## Refer to Appendix for Additional Information

SN = Sample Type and No.  
ST = Shelby Tube Sample  
SS = Split Spoon Sample  
GB = Grab Bag Sample  
WC = Water Content (%)  
N = SPT Blow Counts  
PL = Plastic Limit (%)  
LL = Liquid Limit (%)  
PI = Plasticity Index  
PP = Pocket Penetrometer (tsf)  
-200 = % Passing #200 Sieve

# Boring Log No. B-2



Address: **Intersections of Harry Wurzbach Highway**  
**San Antonio, Texas**  
 Location:

Project: **CIMS-Fort Sam Houston Transportation**  
 Logged By: **ME** Elev.:  
 Sampling Date: **6/29/09**

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N
3" ASPHALT								
10" BASE, tan	1	1: GB	10	16	23	7		
FILL: CLAY (CL), tan, hard	2	2: SS	25	17	40	23		32
FILL: CLAY (CH), dark gray brown to dark brown, hard	3	3: ST	26	22	75	53	5.5	
FILL: Clayey GRAVEL (GC), with Sand, brown, dense	5	4: SS	15					47
Completion Depth: 6.0 ft.	6							
	7							
	8							

Groundwater During Drilling: None Observed

- Grab Bag Sample (GB)
- Shelby Tube Sample (ST)
- Split Spoon Sample (SS)
- Water encountered during drilling
- Delayed water reading

## Refer to Appendix for Additional Information

SN = Sample Type and No.  
 ST = Shelby Tube Sample  
 SS = Split Spoon Sample  
 GB = Grab Bag Sample  
 WC = Water Content (%)  
 N = SPT Blow Counts  
 PL = Plastic Limit (%)  
 LL = Liquid Limit (%)  
 PI = Plasticity Index  
 PP = Pocket Penetrometer (tsf)

# Boring Log No. B-3



Address: Intersections of Harry Wurzbach Highway  
San Antonio, Texas  
Location:

Project: CIMS-Fort Sam Houston Transportation  
Logged By: ME Elev.:  
Sampling Date: 6/29/09

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N
4" ASPHALT								
5" CONCRETE								
4" BASE, tan	1	1: GB	7					
FILL: CLAY (CH), brown, very stiff	2	2: SS	22	16	60	44		16
FILL: CLAY (CH), tan and gray, hard	3							
	4	3: ST	18				5	
CLAY (CL), tan and gray, hard	5							
	6	4: ST	15	22	40	18	6.25	
Completion Depth: 6.0 ft.	7							
	8							

Groundwater During Drilling: None Observed

## Refer to Appendix for Additional Information

- Grab Bag Sample (GB)
- Shelby Tube Sample (ST)
- Split Spoon Sample (SS)
- Water encountered during drilling
- Delayed water reading

SN = Sample Type and No.  
ST = Shelby Tube Sample  
SS = Split Spoon Sample  
GB = Grab Bag Sample  
WC = Water Content (%)  
N = SPT Blow Counts  
PL = Plastic Limit (%)  
LL = Liquid Limit (%)  
PI = Plasticity Index  
PP = Pocket Penetrometer (tsf)

# Boring Log No. B-4



Address: **Intersections of Harry Wurzbach Highway**  
**San Antonio, Texas**  
 Location:

Project: **CIMS-Fort Sam Houston Transportation**  
 Logged By: **ME** Elev.:  
 Sampling Date: **6/29/09**

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N	-200
3" ASPHALT									
6" CONCRETE									
7" BASE, tan	1	1: GB	8						
FILL: CLAY (CL), trace Sand and Gravel, brownish tan to tan, very stiff	2	2: SS	17					16	94
CLAY (CL), tan and gray, hard to very hard	3								
	4	3: ST	15	14	43	29	6.25		
	5								
	6	4: ST	12				13		
Completion Depth: 6.0 ft.									
	7								
	8								

Groundwater During Drilling: None Observed

## Refer to Appendix for Additional Information

SN = Sample Type and No.  
 ST = Shelby Tube Sample  
 SS = Split Spoon Sample  
 GB = Grab Bag Sample  
 WC = Water Content (%)  
 N = SPT Blow Counts  
 PL = Plastic Limit (%)  
 LL = Liquid Limit (%)  
 PI = Plasticity Index  
 PP = Pocket Penetrometer (tsf)  
 -200 = % Passing #200 Sieve

- Grab Bag Sample (GB)
- Shelby Tube Sample (ST)
- Split Spoon Sample (SS)
- Water encountered during drilling
- Delayed water reading

# Boring Log No. B-5



Address: **Intersections of Harry Wurzbach Highway**  
**San Antonio, Texas**  
 Location:

Project: **CIMS-Fort Sam Houston Transportation**  
 Logged By: **ME** Elev.:  
 Sampling Date: **6/29/09**

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N
3" ASPHALT								
6" CONCRETE								
8" BASE, tan	1	1: GB	6					
CLAY (CH), trace Sand and Gravel, dark gray brown, stiff to very stiff	2	2: SS	33	22	82	60		9
	3							
	4	3: ST	35				2.25	
	5							
	6	4: ST	35				2.5	
Completion Depth: 6.0 ft.								
	7							
	8							

Groundwater During Drilling: None Observed

- Grab Bag Sample (GB)
- Shelby Tube Sample (ST)
- Split Spoon Sample (SS)
- Water encountered during drilling
- Delayed water reading

## Refer to Appendix for Additional Information

SN = Sample Type and No.  
 ST = Shelby Tube Sample  
 SS = Split Spoon Sample  
 GB = Grab Bag Sample  
 WC = Water Content (%)  
 N = SPT Blow Counts  
 PL = Plastic Limit (%)  
 LL = Liquid Limit (%)

PI = Plasticity Index  
 PP = Pocket Penetrometer (tsf)

# Boring Log No. B-6



Address: Intersections of Harry Wurzbach Highway  
San Antonio, Texas  
Location:

Project: CIMS-Fort Sam Houston Transportation  
Logged By: ME Elev.:  
Sampling Date: 6/29/09

Soil Description	Depth (ft)	SN	WC	PL	LL	PI	PP	N	-200
5" ASPHALT									
5" CONCRETE									
6" BASE, tan	1	1: GB	9						
CLAY (CH), trace Sand and Gravel, dark gray brown, stiff	2	2: SS	13	17	51	34		15	
	3								
	4	3: ST	34				1.75		
CLAY (CH), trace Sand, tan, very stiff	5								
	6	4: ST	33				2.5		99
Completion Depth: 6.0 ft.									
	7								
	8								

Groundwater During Drilling: None Observed

- Grab Bag Sample (GB)
- Shelby Tube Sample (ST)
- Split Spoon Sample (SS)
- Water encountered during drilling
- Delayed water reading






















## Refer to Appendix for Additional Information

SN = Sample Type and No.  
ST = Shelby Tube Sample  
SS = Split Spoon Sample  
GB = Grab Bag Sample  
WC = Water Content (%)  
N = SPT Blow Counts  
PL = Plastic Limit (%)  
LL = Liquid Limit (%)  
PI = Plasticity Index  
PP = Pocket Penetrometer (tsf)  
-200 = % Passing #200 Sieve

**Arias & Associates, Inc.**

File No.: 2009-461

# KEY TO CLASSIFICATION SYMBOLS USED ON BORING LOGS

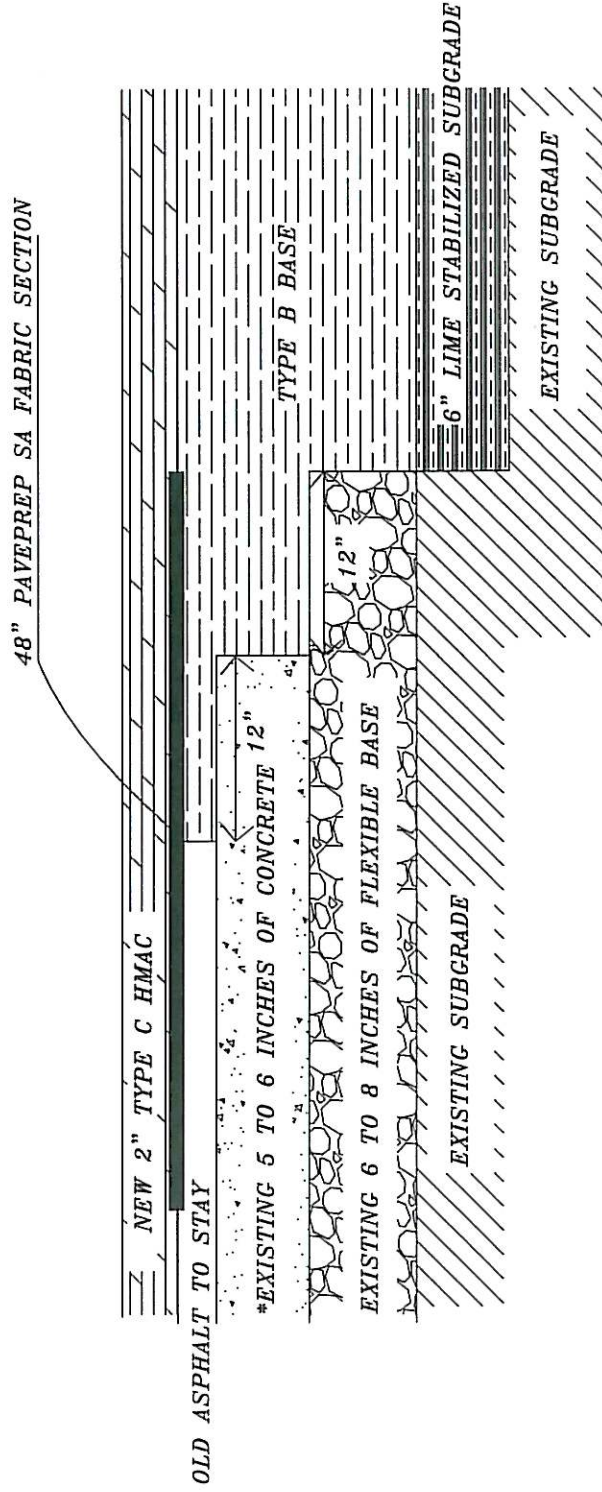
MAJOR DIVISIONS			GROUP SYMBOLS		DESCRIPTIONS	
COARSE-GRAINED SOILS  More Than Half of Material LARGER Than No. 200 Sieve size	GRAVELS  More Than Half of Coarse Fraction is LARGER Than No. 4 Sieve Size	Clean Gravels (Little or no Fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines	
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines	
		Gravels With Fines (Appreciable Amount of Fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures	
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures	
	SANDS  More Than Half of Coarse Fraction is SMALLER Than No. 4 Sieve Size	Clean Sands (Little or no Fines)	SW		Well-Graded Sands, Gravelly Sands, Little or no Fines	
			SP		Poorly-Graded Sands, Gravelly Sands, Little or no Fines	
		Sands With Fines (Appreciable Amount of Fines)	SM		Silty Sands, Sand-Silt Mixtures	
			SC		Clayey Sands, Sand-Clay Mixtures	
	FINE-GRAINED SOILS  More Than Half of Material is SMALLER Than No. 200 Sieve Size	SILTS & CLAYS	Liquid Limit Less Than 50	ML		Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity
				CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
SILTS & CLAYS		Liquid Limit Greater Than 50	MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts	
			CH		Inorganic Clays of High Plasticity, Fat Clays	
FORMATIONAL MATERIALS	SANDSTONE			Massive Sandstones, Sandstones with Gravel Clasts		
	MARLSTONE			Indurated Argillaceous Limestones		
	LIMESTONE			Massive or Weakly Bedded Limestones		
	CLAYSTONE			Mudstone or Massive Claystones		
	CHALK			Massive or Poorly Bedded Chalk Deposits		
	MARINE CLAYS			Cretaceous Clay Deposits		
	GROUNDWATER			Indicates Final Observed Groundwater Level		
				Indicates Initial Observed Groundwater Location		

# PAVEPREP SA SCHEMATIC PLAN

NOTE: LOCATIONS ARE APPROXIMATE  
DRAWING IS NOT TO SCALE

TOP 2 INCHES OF EXISTING ASPHALT WILL BE MILLED  
AND NEW TYPE C HMA<sup>C</sup> WILL BE PLACED BACK

IF IT IS DESIRED NOT TO ADD FILL TO SUBGRADE  
AN ADDITIONAL 2" OF TYPE B BASE COULD BE USED



*\*Paveprep SA should be used in all pavements  
whether concrete pavement exists or not.*

Arias Job No. 2009-461

Proposed CIMS-Fort Sam Houston  
Transportation Projects  
San Antonio, Texas

ARIAS & ASSOCIATES, INC.

## Laboratory and Field Test Procedures

**Soil Classification, ASTM D2487** - Soil testing standard used for classifying soils according to the Unified Soil Classification System. The soil classifications of the earth materials encountered are as noted on the boring logs.

**Soil Water Content, ASTM D2216** - Test determines the water content of soil or rock expressed as a percentage of the solid mass of the soil. The test results are listed under MC in the attached boring logs.

**Soil Liquid Limit, ASTM D4318** - The soil Liquid Limit identifies the upper limit soil water content at which the soil changes from a moldable (plastic) physical state to a liquid state. The Liquid Limit water content is expressed as a percentage of the solid mass of the soil. The test results are listed under LL on the boring logs.

**Soil Plastic Limit, ASTM D4318** - The soil Plastic Limit identifies a lower limit soil water content at which the soil changes from a moldable (plastic) physical state to a non-moldable (semi-solid) physical state. The Plastic Limit water content is expressed as a percentage of the solid mass of the soil. The test results are listed under PL on the boring logs.

**Plasticity Index, ASTM D4318** - The soil Plasticity Index is the numeric difference between the Liquid Limit and Plastic Limit. This index also defines the range of water content over which the soil-water system acts as a moldable (plastic) material. Higher Plasticity Index (PI) values indicate that the soil has a greater ability to change in soil volume or shrink and swell with lower or higher water contents, respectively. Results are listed under PI on the boring logs.

**Standard Penetration Test (SPT) and Split Spoon Sampler (SS), ASTM D 1586** - Standard test method for both the penetration test and split-barrel (spoon) sampling of soils. This sampling method is used for soils or rock too hard for sampling using Shelby Tubes. The method involves penetration of a split spoon sampler into the soil or rock through successive blows of a 140 pound hammer in a prescribed manner.

**Blow Counts (N), ASTM D 1586** - The number of blows required to drive a Split Spoon Sampler by means of a 140 pound hammer for a distance of 12 inches in accordance with the variables stated in the test procedures.

**Shelby Tube (ST), ASTM D 1587** - Procedure for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests of physical properties.

**Rock Core, ASTM D 2113** - Procedure for using diamond core drilling equipment to obtain core samples of rock and some soils that are too hard to sample by soil-sampling methods.

**Dry Density (DD), ASTM D 2937** - Procedure used for the determination of in-place density of soil. The test results are measured in pounds per cubic foot, pcf.

**Unconfined Compression Test (UC), ASTM D 2166** - Test method covers the determination of the unconfined compressive strength of cohesive soil in the undisturbed, remolded, or compacted condition, using strain-controlled application of the axial load.

**Minus No. 200 Sieve, ASTM D 1140** - Test method covers determination of the amount of material finer than a Number 200 sieve by washing. The results are stated as a percent of the total dry weight of the sample.

**Pocket Penetrometer (PP)** - Test method is an accepted modification of ASTM D 1558 test method for establishing the moisture-penetration resistance relationships of fine-grained soils. The test results are measured in tons per square foot, tsf. The strength values provided by this method should be considered qualitatively.

**Rock Quality Designation (RQD)** - The measure of the quality of a rock mass defined by adding intact rock core pieces greater than four inches in length by the total length of core advance per ASTM 6032.

**Recovery Ratio (REC)** - The Recovery Ratio is equal to the total length of core recovered divided by the total length of core advance.

**Boring Logs** - Illustrate a summary of the above described information at each boring location.